N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality
A
Pressure
B
Ulcer

Multicausality
Years smoking
High fat diet
Limited exercise
Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

Yes

Is the treatment tightly controlled by the researcher?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Will the sample be studied as a single group?

No

Correlational Design

Yes

Quasi-Experimental Study

No

Will a randomly assigned control group be used?

Yes

Is the original sample randomly selected?

No

Experimental Study

Yes
Selecting a Descriptive Design

Examining sequences across time?
- Yes
  - Following same subjects across time?
    - Yes
      - Single unit of study
    - No
      - Studying events partitioned across time?
        - Yes
          - Repeated measures of each subject
          - Yes
            - Longitudinal Study
          - No
            - Case Study
        - No
          - Trend Analysis
          - Yes
            - Cross-sectional design with treatment partitioning
          - No
            - Cross-sectional design

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Phenomenon of Interest

Variable 1 → Description of Variable 1
Variable 2 → Description of Variable 2
Variable 3 → Description of Variable 3
Variable 4 → Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses

Group II
{variables measured}

Describe
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Research Variable 2

Description of variable

Development of Hypotheses

Research Design
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Comparison with population values?
        - Yes
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?
- Yes
  - Pretest?
    - No
      - One group pretest/post-test design
    - Yes
      - Repeated Measures?
Selecting The Type of Experimental Design

Pretest

No
Post-test only control group design

Yes
Repeated Measurements?

No
Examine effects of confounding variables?

Yes
Repeated measures design

No
Multiple sites?

Yes
Blocking?

No
Pretest/post-test control group design

Yes
Randomized clinical trials

No
Comparison of multiple levels of treatment

Yes
Randomized Block Design

No
Examination of complex relationships among variables in relation to treatment

Yes
Nested Designs
# Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:**
- Restricted generalizability as control increases
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings:</td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Instrumentation Mortality Limited generalizability as control increases</td>
</tr>
</tbody>
</table>
## Nested Design

### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: &quot;Around the clock&quot; medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit E</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit F</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit G</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit H</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
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</tr>
<tr>
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<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### Research Design

- **Primary Care**
  - Unit A
  - Unit B
  - Unit C
  - Unit D
  - Unit E
  - Unit F
  - Unit G
  - Unit H

- **No Primary Care**
  - Unit A
  - Unit B
  - Unit C
  - Unit D
  - Unit E
  - Unit F
  - Unit G
  - Unit H
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design